chapters on kinetics (F.X. Schmid), the properties of intermediates in the folding process (O.B. Ptitsyn), the covalent trapping of these states (T.E. Creighton), the information gained by mutational analysis (D.P. Goldenberg) and the assembly of large, multi-subunit structures (J.-R. Garel). The concluding contribution by R.B. Freedman takes us into a more biological realm with a description of the apparatus which ensures efficient folding in the cell.

Creighton has chosen his authors well, they all write in a confident and accessible way and between them cover mechanistic and structural principles comprehensively, without drowning the reader in turgid detail. A strength of the book is its appeal to a wide post-graduate and research audience – from biochemists with a penchant for protein engineering to polymer physicists looking to grapple with this 'Holy Grail' of puzzles. The work may not have quite the popular feel of 'The Blind Watchmaker' but for those espousing an interest in protein folding it would be a shame to miss it.

A.R. Clarke

Hydrogen Bonding in Biological Structures; by G.A. Jeffrey and W. Saenger, Springer-Verlag; Berlin, 1991; xiv + 569 pages. DM 198.00. ISBN 3-540-50839-2.

To molecular biologists, the hydrogen bond has become synonymous with the biological specificity of macromolecules. Exploration of the role of the H-bond in molecular recognitio is one of the few aspects of physical chemistry that molecular geneticists are prepared to take on board in designing both in vitro and in vivo mutagenesis experiments. To molecular biologists (for whom the book is written), the role of the H-bond in molecular recognition is conceptually easy to both understand and examine experimentally. The hydrophobic effect, on the other hand, is much more of a taboo subject for experimental molecular biologists. Perhaps the main reason for this is the directionality and linearity used to represent H-bonding in biological systems. Whereas non-linear physical relationships present a challenge to the physicist, they are the source of headaches to the biologist. Therefore, when Waton and Crick produced their elegant model for the structure of DNA, biologists immediately grasped the simplicity of directional Hydrogen bonding, and much less so, features of the base-stacking interactions.

The maintenance of the tertiary structure of proteins and the interaction of proteins with ligands (and other proteins) can be systematically explored by using site directed mutagenesis to remove and displace H-bond donors and acceptors. Therefore, a standard reference on the H-bond is a most welcome addition to the literature as biologists embark on increasingly ambitious molecular recognition studies. In order to pose more subtle questions, a detailed knowledge of the H-bond is required. That the bulk of the literature concerning experimental and theoretical aspects of H-bonds is inaccessible to biologists is a fact. The authors have therefore provided the biological community with an invaluable reference source to sharpen thinking about new experiments in molecular recognition.

The authors set out to cover in great detail the definition, experimental and theoretical description of H- bonding in small molecules (of biological interest), macromolecules and the special place of water in the scheme of things. There is a discussion of the geometry and lengths of different classes of hydrogen bonds. The treatment I found both readable, comprehensive and an invaluable encapsulation of a literature which is largely alien to me, although clearly of real significance to the biologist. By far the most frequently cited experimental techniques used to underpin the authors' discussion are X-ray and neutron diffraction and their bias is towards static images of H-bonds in crystalline structures. At this stage, however, I would agree that we need a description of H-bond geometry in the static state before we begin to explore a 'moving target' by magnetic resonance techniques.

My only real criticism of the book is the cursory treatment of the use of site directed mutagenesis in conjunction with X-ray crystallography and thermodynamic/kinetic experiments to address the role of H-bonding in protein stability, folding and ligand binding. This is the prime area of interest for biologists and the authors are most able to make an input here into the design of new experiments and the suggestion of aspects of H-bonding that have as yet not been addressed. Of course this, it may be said, can now be done with more confidence having read the book, but it would have been useful to have expanded this section.

I welcome the addition of this book to my shelf since it provides a firm physio-chemical foundation for exploring and evaluating the role of H-bond in biology. With the relatively routine ability to introduce selective point mutations into proteins (and nucleic acids), this both provides a perfect companion for the biologist as a first step towards designing such experiments.

David Hornby

Enzymic catalysis; edited by A.R. Fersht and D. Gani, The Royal Society; London, 1991; v + 78 pages. £32.50 (UK), £35.00 (overseas). ISBN 0-85403439-0.

This short book includes ten review essays which were presented at a Royal Society of London Discussion Meeting on Enzyme Catalysis in December 1990. The authors, all major figures in the enzyme field, present an excellent and representative review of the current state of enzymology.

Three articles by Robinson, Cane and Gani show how organic

chemists are tackling challenging problems in the enzyme field. Robinson reviews our current knowledge of polyketide biosynthesis with emphasis on the analogies to fatty acid biosynthesis and the major recent contributions made to the field by the molecular geneticists. Cane covers terpene biosynthesis and the stereochemistry of enzyme catalysed allylic addition-elimination reactions. Gani makes a structural and mechanistic comparison of the pyridoxal 5'-phosphate dependent decarboxylases and transaminases.

A brilliantly lucid essay by Knowles (regrettably one of his final contributions to the field) describes triose phosphate isomerase, a paradigm for those seeking to understand enzyme catalysis. Also in the area of mainstream enzymology Holbrook reviews his long term studies of NAD-dependent lactate dehydrogenase culminating in his successful attempt to produce a malate dehydrogenase on a lactate dehydrogenase framework. There is a comprehensive account of the mechanism of sulphate activation by Lowe which brings to centre stage a previously rather neglected area of enzymology.

On the theoretical side Page, as he has frequently done before, discusses the energetics of intramolecular reactions and enzyme catalysis.

Two articles cover protein structure and folding. Campbell discusses protein modules with particular emphasis on the chimeric proteins involved in blood clotting. He describes the role of high field nuclear magnetic resonance spectroscopy and recombinant DNA technology in determining the structure of these molecules. The highlight of the book is the chapter by Fersht on the pathway and stability of protein folding. In the early 1980's Fersht was a pioneer in the use of protein engineering techniques to study enzyme catalysis. He has now adapted his approach of making small carefully chosen changes in proteins to study folding and has already made very significant progress.

No modern book on enzymes would be complete without a chapter in abzymes. Schultz provides an admirable account of this fascinating and important area

Overall, this is a splendid collection of very readable essays which could very easily form the basis of an advanced course on enzymes. It also provides enzymologists with a solid account of the state of their field at the beginning of the 1990's. My only regret is that the relatively high cost of this book will restrict its availability. Surely it could have been produced less lavishly in paperback form with the aim of having a larger circulation. It certainly merits a place on the bookshelf of any serious enzymologist.

John R. Coggins

Enzyme Assays: A practical approach; edited by R. Eisenthal and M.J. Danson, Oxford University Press; Oxford, 1992; xxiv + 351 pages. £25.00. ISBN 019-963143-3.

In spite of the growth of molecular biology, the determination of the activity of enzymes remains central to much biochemical research. Such measurements are, furthermore, undertaken by life scientists with very varied backgrounds and experience, so that guidance about appropriate techniques, the precautions needed to obtain valid and reliable results, and the pitfalls that may entrap the incautious can be very helpful. This book, written and edited by enzymologists with long experience of the topics they describe, covers all these aspects.

The first chapter discusses the principles of enzyme assay and is followed by six chapters each dealing with a different assay technique: absorbance and fluorescence photometry; radioactivity measurements; high pressure liquid chromatography; polarography; the oxygen electrode; and the pH-stat. The theoretical basis of each technique and the appropriate instrumentation are described, together with potential sources of error and how to avoid them. Experimental methods, in many cases detailed protocols, are given for the assay of selected enzymes, in order to illustrate the scope of each technique and to guide readers in applying the methods to other systems. It is encouraging to find a range of techniques described and appraised, and it is to be hoped that experiments will be stimulated to explore some of the less familiar methods, since they can offer substantial advantages in suitable cases.

The remaining four chapters cover ancillary topics important in the study of enzymes Those dealing with the detection of enzyme activity after gel electrophoresis and isoelectric focussing, extracting and stabilising enzymes, and buffers and protein determination gather valuable practical information which is scattered and sometimes hard to find. The chapter on statistical analysis of enzyme kinetic data deals only with the determination of K_m, V_{max} and K_i values. It emphasizes the importance of using sound data and sound methods of analysis, and then explains clearly and simply how to do so.

Although most enzymology texts contain something, usually quite brief, about assay methods and their problems, and there are several extensive, and expensive, compendia of methods, the value of this book is that it offers, in a manageable length, a practically-orientated guide for the inexperienced, while containing much useful information and some timely reminders for those who have been doing assays for years.

Kenneth M. Jones